A Guide for Your Business

Smart Production and the Maine STEP-UP Program

- **Smart Production and How It can Help your Business save Money**
- **Maine Businesses Pursuing Smart Production**
- **The Maine STEP-UP Program**

DEPARTMENT OF ENVIRONMENTAL PROTECTION · STATE OF MAINE ·

$mart Production is $mart Business and Good for the Environment

As a business owner or operator, you are always looking for ways to ensure the short- and long-term health of your company. I'm not telling you anything new by acknowledging that the healthier your business is, the better it can take care of its owners, managers, and employees. Also, the more competitive your business is, the easier it is to increase market share. The simple truth is that the more your business thrives, the more it benefits your community and the state of Maine.

As public employees here at the Maine DEP, a primary responsibility of ours is helping businesses achieve their goals in ways that eliminate or substantially reduce pollution. After all, waste generated is literally money being thrown away, and often is pollution being released into our environment, which degrades the quality of life for all of us.

We have developed **Smart Production** as a concept that companies can use to assist them in achieving short- and long-term environmental protection and business goals. It provides guidance in the ongoing quest for increased profits and improved environmental performance. Smart Production encourages companies to design or employ reusable and recyclable products that are manufactured using the least amount of energy and raw materials possible, while preventing waste.

Smart Production starts with a complete analysis of existing manufacturing processes and end products to establish a baseline regarding all aspects of the operations of a business -- from raw material and energy use, to product reuse, material recycling, and waste generation and disposal. Progress is measured from this baseline. ***Systematic*** analysis of processes and end products will build teamwork among employees, so that cost savings and waste minimization are part of the day-to-day work that everyone at the company performs. Experience in Maine and around the world shows that, as your team focuses on continually finding ways to improve products and operations, the company will grow stronger while improving protection of the environment.

We hope you find that this guide provides some inspiration as well as practical information for your business. It doesn't offer a formula or one-size-fits-all approach. Each business is unique, so reach high and apply what you think is appropriate for yours. Good fortune on your journey!

Dawn R. Gallagher, Commissioner
Maine Department of Environmental Protection

Smart Production and the Maine STEP-UP Program

This guide provides information and tools businesses can use to improve their environmental and business performance. Smart Production is the complete integration of business and environmental objectives; in fact they become one and the same. Environmental protection becomes a business opportunity. The guide features Maine businesses who have merged their business and environmental objectives and realized substantial savings. The guide also introduces the Maine SMART TRACKS *for* EXCEPTIONAL PERFORMERS *and* UPWARD PERFORMERS (STEP-UP) Program. The STEP-UP Program offers recognition and other incentives to businesses that want to implement Smart Production practices. The STEP-UP Program seeks to establish a *fundamental change* in the relationship between the Maine Department of Environmental Protection and Maine businesses to help them produce "smartly" and save money.

In 2002, seven Maine businesses signed STEP-UP agreements with the State of Maine including Alan Auto, Bath Iron Works, Fairchild Semiconductor, Guilford of Maine, Moss Inc., NorDx, and Poland Spring Bottling Company. A description of each company and their agreement can be found on the Department's web page at: www.state.me.us/dep/oc/stepup/index.htm

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Cover: (top) Paul Paydos, Vice President Technical Services, Guilford of Maine, Inc.
(center right) Alan Prosser, owner Alan Auto.
(center left) Ian Lebauer, President, Goodkind Pen Company

Produced by the Maine Department of Environmental Protection
Dawn R. Gallagher, Commissioner
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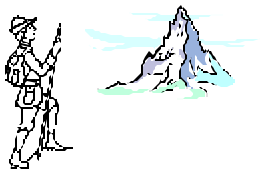
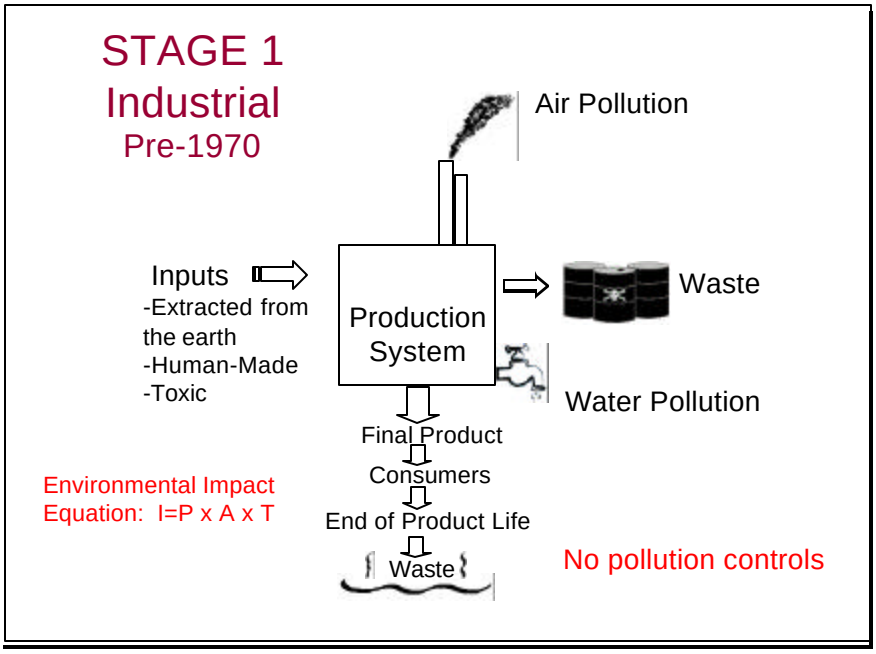


Introduction:

Businesses in Maine, across the United States, and around the world are finding ways to protect the environment while benefiting their bottom line. Environmental protection used to be viewed as an added cost to doing business and as a means of risk avoidance that diminished the profit column of the ledger. But that old mindset is changing. Four distinct stages to environmental protection and regulation can be identified: Industrial; Regulatory; Pollution Prevention; and Designing Integrated Ecological Business Systems.

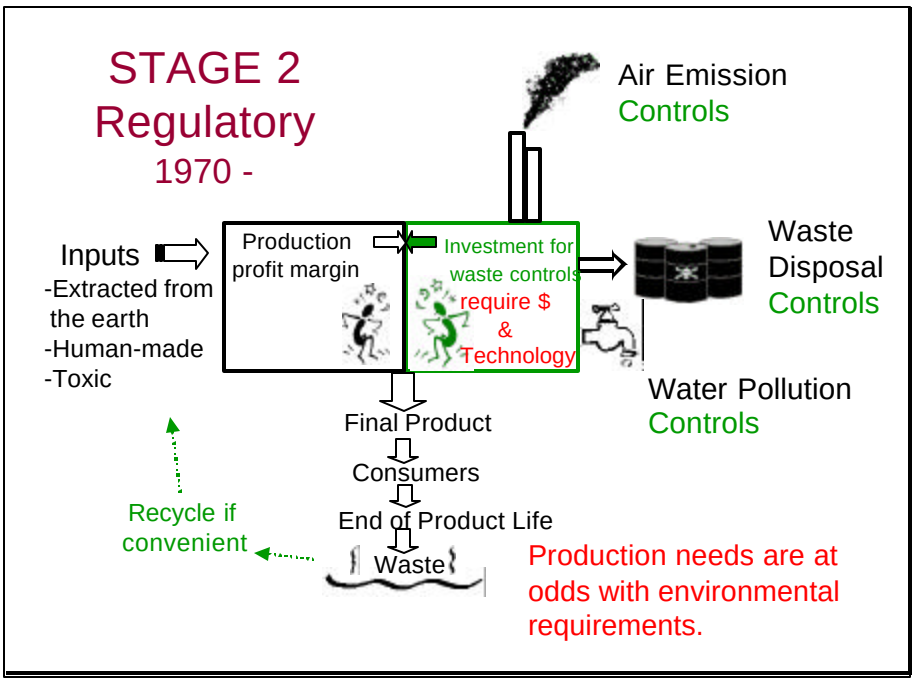
The Industrial stage was marked by few laws protecting the environment. The resources of the earth—clean air and water, land, minerals, and wildlife—were thought to be inexhaustible, if considered at all. Resources provided inputs to the production system, products were made, and waste was produced. This time period, prior to 1970, is represented in the **Stage 1** diagram (below).

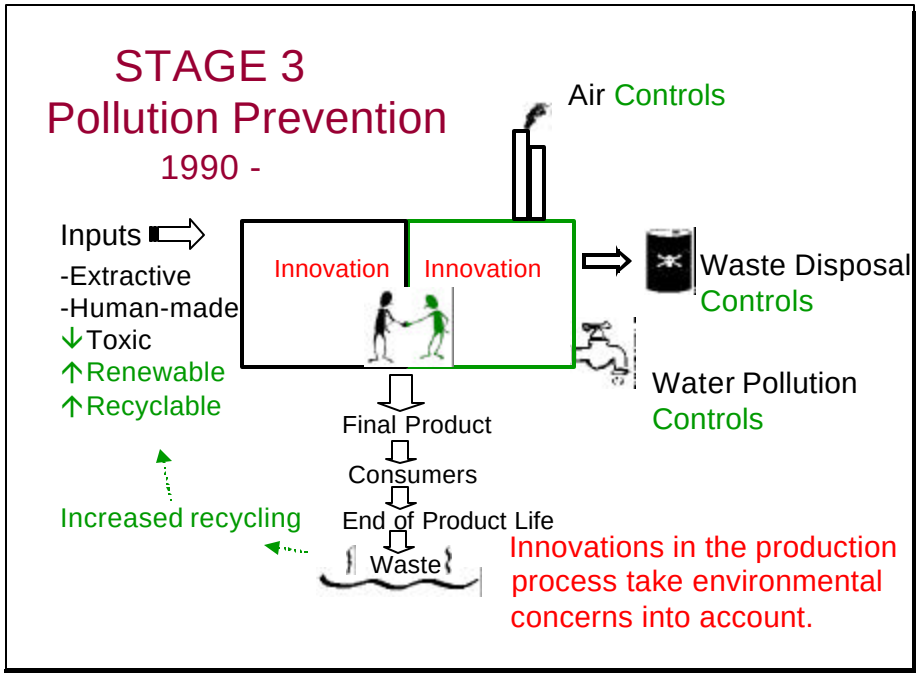


Human impacts on the environment of a given region result from the population's size, its affluence, and the types of technologies it relies on. Prior to 1970, more affluent and technologically advanced societies had a greater impact on the environment than poorer societies where advanced technologies were less pervasive. Environmental impact can be measured by the following equation: **I**mpact = **P**opulation x **A**ffluence x **T**echnology. In **Stage 1**, technology served the production process but was not employed to protect the environment. The condition of the Androscoggin River in the 1960s was emblematic of the general lack of regard for the environment. Toxics were incorporated into products with little consideration as to how they would affect the environment and consumers. Products were discarded in landfills and rivers or burned, releasing pollutants into the air.

During the 1970s and 80s, it became apparent that pollution and waste disposal were

seriously degrading our environment. Growing public concern over visible degradation led government to establish compliance-driven programs at the federal and state level. These programs began an effective cleanup of air and water pollution. This regulatory period is represented in the **Stage 2** diagram (right). Growing alarm about waste overwhelming communities also led to the establishment of limited recycling programs. Waste controls placed at the end of smokestacks and effluent discharge pipes made a substantial positive impact. Maine residents have to look no farther than the Androscoggin River today, normally all of which is swimmable, to see the results. However, these controls required money and technology and were viewed as being at odds with efficient production and profit. As a result, the relationship between business and government was adversarial. The prevailing view during the regulatory stage was that we could not have a clean environment and a robust economy.

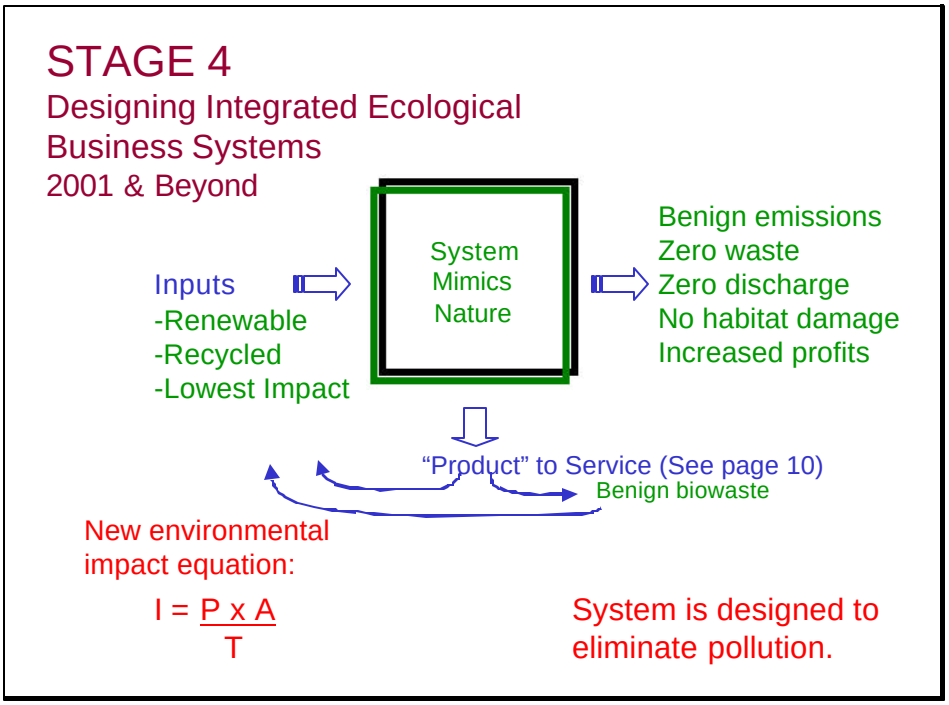




During the 1990s, many companies instituted pollution prevention programs thereby reducing pollution abatement costs. Pollution prevention represented a significant shift from the "end-of-the-pipe" control practices begun in the 1970s; it sought to use renewable and recyclable inputs thereby reducing the amount and toxicity of the waste stream. Using renewable and recyclable inputs is often less expensive than extracting virgin raw materials. (For example, it requires 95% less energy to make an aluminum can from recycled material than ore.) Better waste stream analysis leads to waste reduction and in-

creased production efficiency, thus allowing businesses to realize economic benefits. This approach is represented in the **Stage 3** diagram (previous page). In this stage, the use of some technologies help to slow environmental degradation but do not stop it. For example, furnaces that can burn oil more cleanly mitigate ecological impacts but do not halt them. In the pollution prevention stage, the environmental impact equation remains the same as in **Stages 1 & 2** as population, affluence, and access to technology increase, so does human impact on the environment.

Stage 3 represents an eco-efficient system; it does more with less, but it is not sustainable. If current economic and population growth continues, the earth will eventually be unable to sustain the impact. Evidence of this is found in the new environmental challenges that face us today: ozone depletion, global warming, ground water pollution, soil erosion, and species extinction, among others. These problems are of global concern but they require local action to solve because they involve a shift in the way we live our lives.



Stage 4 (left) represents a second Industrial Revolution. The next Industrial Revolution requires that government, industry, and consumers make environmentally sound choices. If these choices are made, the environmental impact equation will change, so that technology becomes a factor that decreases, rather than increases, impact. If technology can reduce human impact on the environment, natural processes can take over to provide clean air and water, and healthy plants and wildlife.

In the new equation: **I**mpact = **P**opulation x **A**ffluence / **T**echnology

Pollution is eliminated because production processes are designed from the outset to avoid the creation of waste. In natural systems there is no waste. This final stage is a closed loop system that mimics nature, where by-products of a production process "nourish" another production process. In **Stage 4**, environmental needs and economic needs are inextricably linked to and reliant on one another. The next Industrial Revolution is characterized by sustainable produc-

tion which meets the needs of people living today while ensuring that future generations will have the resources they need to meet their needs.

What is Smart Production?

The essence of Smart Production is the realization that business and environmental objectives must be one and the same if businesses are to become sustainable. Smart Production views environmental protection as a business opportunity rather than an added cost. It leads to long-term economic benefits and requires a long-term view that ultimately all economic and social systems depend upon a healthy natural environment.

What differentiates Smart Production from "end-of-the-pipe" environmental protection?

Smart Production seeks to reduce the environmental impact of the *entire* production process including the impacts of products during their entire life cycle. Rather than treat or clean waste water, for example, Smart Production looks to eliminate its creation in the first place. This type of systems approach requires a holistic understanding of the pattern of interrelationships among key components of the production process with the **goals** of:

Smart Production means businesses producing products and providing services in more sustainable ways. Businesses take their cues from the marketplace. As consumers we can vote with our dollars, buying products and services from businesses that protect the environment and have a long term view. This provides us with a tremendous opportunity. We can learn about the environmental performance of businesses and their products before making our purchases. Ask businesses what they're doing to reduce energy use, waste and toxic chemicals. Seek out products made from recycled materials. Look for products that are recyclable at the end of their useful life. Select energy efficient vehicles and appliances. Make a change and make a difference.

Dawn R. Gallagher, Commissioner, Maine DEP

Mount Katahdin

- **mimicking natural processes by using renewable materials and energy as inputs, while eliminating the use of toxic and non-renewable materials;**
- **enhancing a business's long-term economic viability;**
- **producing products that can be recycled and that have low life cycle environmental impacts; and**
- **eliminating discharges of pollutants to air, water and land.**

Climbing to the Top of the Mountain: A Vision of Smart Production

The Maine Department of Environmental Protection formed a Smart Production Advisory Committee to provide advice and counsel in developing the Smart Production initiative. (Members of the Committee are listed on page 31). From this effort emerged a vision of Smart Production that is expressed in the **"Climbing the Mountain"** diagram below.

SMART PRODUCTION

"Climbing the Mountain"

REDUCE ENVIRONMENTAL IMPACTS

UNSUSTAINABLE → **SUSTAINABLE**

PROGRESS

Pathways	Valley	Foothills	Top of the Mountain	Metrics
PRODUCT TO SERVICE	Sell Product	Product Stewardship	Lease Service	**Product** *Percent of products produced that are durable, repairable or readily recyclable*
WORKERS & COMMUNITY	Unaware / Access to Environmental Information	Environmental Ed. & Training	Extended Producer Responsibility / Forum for Meaningful Involvement / Life-long Learning, Awareness, Business/Community Harmony	**People** *Employee, consumer, community awareness benchmarks*
TRANSPORTATION	One-person Car Commuting / Truck Shipping / Rail, Ocean	Car Pool / Compliance & Remediation Driven	Hyper Car / Mass Transit / Pollution Prevention / Telecommute, Video Conf.	**Transportation** *Energy used and emissions generated per unit of work or product shipped*
ENVIRONMENTAL MANAGEMENT	Product Weight	Employ tools, EMS, Life-cycle Analysis, etc.	Local Prods./Consumption / Environment Part of Core Business Values/Strategic Business Planning	**Management** *Quantitative assessment of management performance*
TOXICS	Toxics Used	Reduce Volume	Substitute less toxic materials / Eliminate Toxics	**Toxics** *Toxics used, hazardous waste generated, toxics emitted per unit of product*
INPUTS, RAW MATERIALS & PRODUCTS	Take-Make-Waste	Maximize Value-Added	Minimize Material in Product / Closed Loop	**Raw Materials** *Amount of non-renewable/toxic materials used per unit of product*
AIR AND WATER EMISSIONS	Toxics and Conventional Emissions Controls	Beyond Compliance	Zero Discharge/ Harmless Emissions	**Emissions** *Air emissions per unit of product, Water discharge per unit of product*
SOLID WASTE	Make Waste	Prevent Waste / Reduce/Reuse/Recycle	Zero Waste Generated/ Create Only Harmless Waste	**Waste** *Solid waste/hazardous waste per unit of product*
ENERGY	Fossil Fuels: Coal ® Oil ® Natural Gas	Biomass / Hydropower / Efficient Energy Use	Minimize Energy Used / Hydrogen / Wind / Solar	**Energy** *Total energy used, percent of renewable energy used, and carbon emitted per unit of product*

The goal at the top of the mountain is a sustainable business. To achieve this vision, ambitious goals are set for **nine** pathways up the mountain. Different paths are appropriate for different businesses and each business must decide how to make its own climb to the top.

The climb starts in the valley where current activities are unsustainable from an environmental and business standpoint. It is from here that most businesses will begin their ascent. As we approach the foothills, there are incremental steps that can be taken to benefit the business and the environment. Reaching the summit will mean achieving a sustainable enterprise from both the standpoint of the business and the environment.

Metrics, tools for measuring environmental performance, track progress along the climb. Each business must decide which type of metrics best suits its needs. The determination of which metrics to use depends on the nature of the business, its environmental impacts, regulatory requirements, costs of collecting the data, and interests of stakeholders, among other potential considerations. For example, metrics in manufacturing could include measurement of the amount of solid waste generated per unit of product. In the service sector, metrics could include the amount of energy used per unit of service delivered. Suggested metrics are shown in the "Climbing the Mountain" diagram.

To guide the journey, an environmental management system (EMS) can be employed. An EMS is the part of a company's overall management system that describes standard operating procedures designed to protect the environment, ensure quality products or services, and safeguard worker health and safety. EMSs provide frameworks for environmental plans including the allocation of resources, job assignments, and evaluation of progress. Integral to the EMS concept is an auditing system that gauges conformance with the EMS plan. EMSs are customizable tools. They can be applied to companies regardless of size and may incorporate any number of processes. Implementation of an EMS requires top level support, a significant amount of planning, and an on-going commitment to continuous improvement.

Let's consider each pathway on the climb:

Energy

Energy is the first step because changing fuel sources and/or employing energy saving technologies can provide immediate and substantial benefits to a business and the environment. In the valley we find use of fossil fuels, with coal being the least desirable from an air emissions standpoint because coal burning releases the largest amount of carbon dioxide (CO_2) into the air. As we approach the foothills, we see a shift to oil, which has lower CO_2 emissions than coal, followed by natural gas because of its even lower CO_2 emissions and fewer contaminants. For some businesses, renewable fuels, such as biodiesel and woodchips, can be used to replace or augment the use of fossil liquid and solid fuels.

The US makes up **4.5 %** of the World's **population** and consumes **25%** of its **energy.**

But starting the climb does not necessarily mean switching energy sources. For most businesses, it is not difficult to make more efficient use of energy. For example, purchasing more efficient boilers can generate immediate savings. Making sure that an oil furnace is properly maintained and serviced or buildings are adequately weatherized will also return immediate savings in energy use. New building construction can offer significant savings as well, because advanced building design can incorporate super-insulation concepts, solar heating, in-floor radiant heating, and highly efficient window glazing options, to name a few.

At the top of the mountain, we find use of solar and wind energy which are renewable forms of energy and therefore sustainable. Interface, Inc., a Fortune 500 flooring manufacturer and parent company of Guilford of Maine, installed a 100 kilowatt solar array at its Bentley Mills facility in California, where broadloom carpet is produced. The manufacturing looms operate partly on solar energy, and the carpet requires about a third less energy to produce than conventional carpeting.

Solid Waste

Businesses have traditionally accepted waste as an unavoidable consequence of production, but this view is changing. Solid waste reduction, like energy use reduction, is a pathway where businesses can realize immediate cost savings. Preventing waste saves on material costs because most wastes can be used for beneficial purposes, including being reused in the production process. Preventing waste also reduces costs of disposal and saves on related energy costs.

> The earth can't withstand a systematic increase of material things. If we grow by using more stuff, I'm afraid we'd better start looking for a new planet.
>
> - Robert Shapiro, former CEO Monsanto Company
>
> From *Materials A Report of the Interagency Working Group on Industrial Ecology, Material and Energy Flows*, 1998.

The goal is zero waste generated or the creation of only harmless wastes that can be composted or otherwise disposed of safely. Understandably, this is a long-term goal, the attainment of which requires great foresight and commitment.

Air and Water Emissions

In the valley, toxic and conventional emissions, including nitrogen oxides (NO_x) and sulfur dioxide (SO_2), have been reduced by end-of-pipe pollution control devices. CO_2 emissions, however, are not regulated and continue to increase. It is CO_2 that is largely responsible for the climate altering "greenhouse effect" that is being intensified by human activities. Today, a significant source of human-produced CO_2 results from coal burning to generate electricity and the combustion of petroleum products from diffuse sources, such as home oil burners and motor vehicles. Reducing energy consumption will help to reduce air emissions, but more substantial reductions may require capital investments or industrial process changes. For this reason, the air and water emissions pathway is a challenging one.

The goal is zero discharge. To accomplish this, manufacturers will have to develop closed

loop systems where chemicals in process streams are recycled within the plant. However, reducing air and water emissions often leads to more efficient production, saves money, and increases worker health. Moreover, the company that achieves zero discharge can transcend government regulations altogether, because if a factory is emitting no harmful emissions, it requires no regulation. Because fewer emissions tend to correlate to more efficient production, the company can effectively compete with, and even out-compete, manufacturers in countries with lax regulations. Emissions, if they occur, should be harmless to the environment.

Inputs, Raw Materials and Products

According to the Federal Interagency Working Group on Industrial Ecology, Material, and Energy Flows, U.S. consumption of energy, food, transportation, consumer products, and infrastructure requires an amount of materials that is equivalent to 300 shopping bags per person per week.

> If people are to prosper within the natural world, all the products and materials manufactured by industry must after each useful life provide nourishment for something new. Since many of the things people make are not natural, they are not safe "food" for biological systems. Products composed of materials that do not biodegrade should be designed as technical nutrients that continually circulate within closed-loop industrial cycles—the technical metabolism.
>
> William McDonough and Michael Braungart, "The Next Industrial Revolution", *The Atlantic Monthly* October, 1998.

In the valley, materials are taken from the earth, products are made, and waste is generated. Smart Production strives to maximize the life, utility, and value of materials. Raw materials and embodied energy, the total amount of energy that goes into making a product, can be reduced by minimizing the total amount of material incorporated into products. It may be necessary to redesign products to achieve these reductions. Smart Production's ultimate goal is to create a closed loop system, where materials already extracted from the earth are continuously recycled to make new products.

Toxics

In the valley, thousands of new compounds are created each year in laboratories. Some of these are toxic and find their way into industrial processes and consumer products. As we climb the mountain, the volume of toxic chemicals used is reduced, and they are replaced by chemicals less toxic to biological organisms. The result is more sustainable and safer products. The ultimate goal is the elimination of toxics, since their introduction into the environment may have unforeseen consequences.

Environmental Management

In the valley, the focus is on complying with environmental laws. Moving into the foothills, we find a new focus emerging; pollution prevention. Pollution prevention differs from Smart Pro-

duction in that it tries to solve each problem in the process individually without looking at the system as a whole. Changing a process so as to generate less hazardous waste is an example of pollution prevention. Pollution prevention is a critical first step that may encourage more holistic problem solving in the future. By comparison, Smart Production uses a systems thinking approach to product or service design. This means creating a whole system from parts that interact to minimize waste, inefficiency, and environmental impact, while maximizing worker health and safety, and business profitability. Redesigning a product so that its production generates no hazardous waste is an example of Smart Production. The greatest benefits will be realized when a business makes concern for protecting the environment part of its core values.

Transportation

Currently, most shipping is predominantly done by truck. When trucks are the only option, the use of biodiesel, at least seasonally, can eliminate the release of fossil carbon dioxide and reduce diesel emissions. When feasible, rail or ocean transport is relatively less polluting per ton of product shipped.

To start the climb, some companies can seek to reduce the material content of their products, thereby reducing their weight and volume to save on packaging and shipping costs. Businesses can also take advantage of the fuel-efficient hybrid-gasoline electric vehicles. These vehicles achieve gas mileage in the 60 to 80 miles per gallon range. Their gas mileage, and the fact that they are also super low emission vehicles (SULEV), translate into a considerable reduction in CO_2 emissions. As early as 2005, fuel cell-powered vehicles that are predicted to get up to 200 miles per gallon may be on the market. Another option involves telecommuting and video conferencing. An employee with a computer and modem access to the central office can carry out business functions without leaving his or her home. One advantage to video conferencing is reduction in travel and associated air emissions.

Where feasible, local production of commodities can also save on transportation and related environmental costs and provide increased local employment. Maine's Department of Agriculture encourages Maine consumers to buy locally produced agricultural products. Spin-off benefits include keeping agricultural land in production, which retains open space and wildlife habitat.

Workers and Community

Workers can be a business's greatest resource for finding ways to produce smartly. In the valley, workers are unaware of environmental concerns. To help their business ascend the mountain, workers need access to environmental information and training. They also need a meaningful forum through which they can become involved in company decisions. Some companies provide rewards and recognition for employee-suggested innovations.

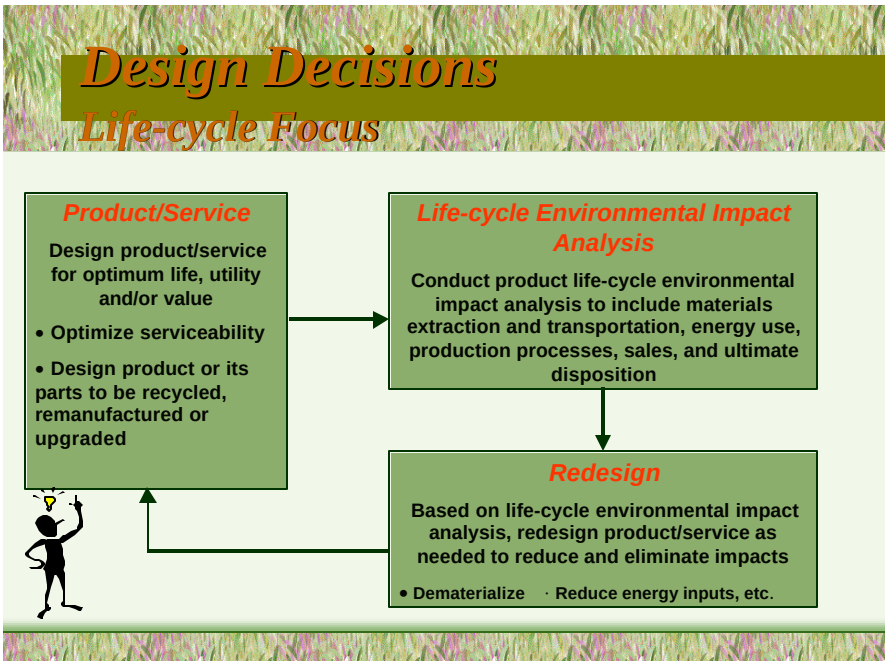
Businesses are also reaching out to the communities in which they operate to explain their environmental goals and performance and invite public scrutiny. This leads to increased trust between the community and the business and may translate into community support for products and future business development.

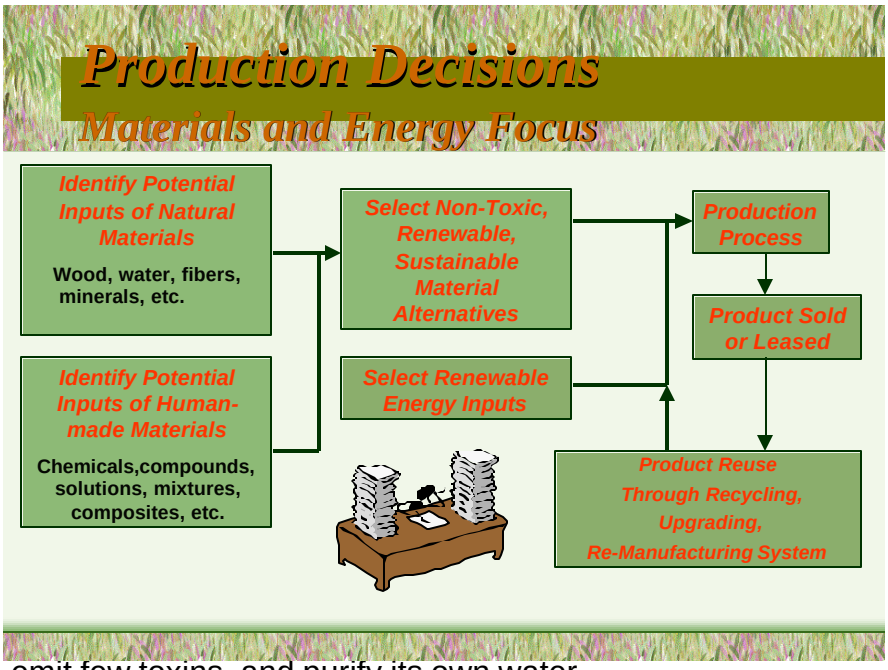
Product to Service

In the valley, once products are sold a company has little responsibility for them. As a business climbs the mountain, it adopts the concept of product stewardship. Product stewardship involves designing a product that minimizes environmental impact and educating the consumer about the safe use and proper disposal of that product. Extended producer responsibility goes a step further. A product is serviced by the company until the end of its useful life and then it is returned to the company to be recycled.

To become a sustainable enterprise, a company must examine its products and the impact they have on the environment. Where feasible, the goal is to lease a service rather than sell a product. Leased products are more likely to be well-designed, built, and maintained, thereby making more effective use of materials and embodied energy. Leased products also will more likely have a system in place for their recovery.

Decisions in the Smart Production Process



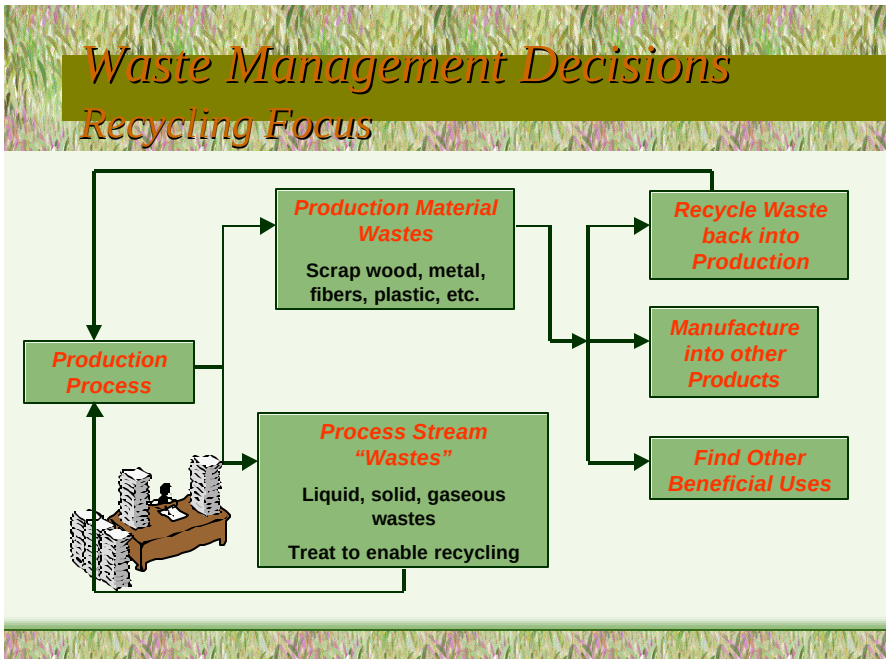


Smart Production involves three types of decisions:

- **Design Decisions**
- **Production Decisions**
- **Management Decisions**

Smart Production design decisions employ life-cycle analysis which look at the total impact that the product has on the environment from its production, during its use, to its ultimate disposition. It means designing products that are reusable, recyclable and/or compostable. Paul Hawken calls this "cradle-to-cradle" manufacturing. He explains: "every product or by-product is imagined in its subsequent forms even before it is made. Designers must factor in the future utility of a product, and the avoidance of waste, from its inception" (*The Ecology of Commerce,* 1994). William McDonough, a world renowned architect, applies Smart Production design ideas to entire factories. He was hired by Ford in 2000 to transform the company's 1,212-acre Rouge River plant site in Dearborn, Michigan into a model for the future. The plant will have a grass-topped roof, emit few toxins, and purify its own water.

Production decisions involve a focus on using non-toxic and sustainable material alternatives, as well as a focus on using renewable energy inputs.



Smart Production waste management decisions focus on recycling waste material from the production process back into the process, making waste into other products, finding other beneficial uses for waste, and/or ensuring that, at the time of disposal, a product is completely biodegradable. Industrial process stream waste should be treated to enable its continued use in the production process and avoid its discharge into the environment. Buckminster Fuller said: "Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we've been ignorant of their value." (Materials: A report of the Interagency Working Group on Industrial Ecology, Material, and Energy Flows. August, 1998 p 20). William McDonough insists: "Companies that don't recognize that they're squandering their assets may come to the realization too late to be competitive." ("Eco-Architect Bill McDonough's Green Vision" by Jim Doyle *The San Francisco Chronicle* April 1, 2001 p 26).

Maine Businesses Making the Climb

The concept of a sustainable world is a vast and comprehensive one. It will require broad thinking and vision to become a reality, but it begins with small steps on the climb. There are Maine businesses already using concepts of Smart Production everyday. We chose to focus on five of them: Guilford of Maine, Inc., International Paper, Goodkind Pen Company, Inc., Alan Auto, and Auburn Machinery, Inc. Goodkind Pen Company and International Paper both won Governor's Awards for Environmental Excellence in 2000 (International Paper won two awards). Guilford of Maine and Auburn Machinery received awards in 1998, and Alan Auto in 1995. Despite their differing sizes and product lines, all have made substantial progress on the climb toward sustainability. Along the way they have realized monetary and environmental benefits.

Guilford of Maine, Inc., Guilford:
On a journey to sustainability

Guilford of Maine is a subsidiary of Interface, Inc., a Fortune 500 office flooring and upholstery manufacturer. Guilford of Maine manufactures the majority of fabric used for US-made office furniture. Ray Anderson, former CEO of Interface and author of *Mid-Course Correction* (Chelsea Green, 1998), is a vocal proponent of sustainability, having made a commitment in 1995 to transform his company into a sustainable enterprise. It is from Anderson's "climbing the mountain" metaphor that the "Climbing the Mountain" diagram originated. Over the past six years, Guilford of Maine has made significant strides toward achieving Anderson's goal.

The company measures its resource use and waste generation using "Eco-Metrics." Eco-Metrics track the amount of material entering and leaving the plants, dividing it into three categories: raw materials, product, and waste. Eco-Metrics are standardized to production. For example, a measurement for solid waste would be pounds of solid waste per linear yard of fabric produced. Areas included for measurement by metrics are: fuel and electricity usage, water consumption, solid waste, and emissions. The company set out on the climb with the specific goals of eliminating waste, releasing only benign emissions, using renewable energy sources, closing the loop, using resource efficient transportation, involving the community, and redesigning commerce (which embodies the principles of extended producer responsibility). Eco-metric charts on the following pages demonstrate the improvements that Guilford has made over the past five years.

Paul Paydos holding PLA fabric . For more information visit: www.cdpoly.com

Guilford's vision of sustainability involves using rapidly renewable raw materials instead of fossil fuel based materials, whose formation was a one time geologic event. The company has recently decided to use a fabric made of 100% polylactide polymer (PLA). The polymer, developed by the Cargill Dow corporation, is made by processing natural corn sugars. PLA is completely compostable and, according to a Cargill Dow press release, it performs as well or better than conventional synthetic alternatives while requiring less fossil fuel to produce. Paul Paydos, vice president of Technical Services, is well-aware that there will be those who criticize the use of a food source to make fabric. He points to the vast amount of corn left in storage annually in America, and notes that a 400 million pound PLA plant currently under construction in Nebraska will use less than one half of one percent of annual US corn production. The PLA fabric has just been introduced, but Guilford's main product line, Terratex®, is already environmentally friendly. Terratex® is made using PET (polyethelyne terephthalate) plastic from

recycled soda bottles. About 240 bottles are recycled to produce 20 yards of Terratex.® (for more information see *Indicators of Sustainable Production: A Case Study on Measuring Eco-sustainability at Guilford of Maine, Inc.,* Griener, 2001). Currently, Guilford of Maine obtains 75% of all of its raw materials from recycled products. At times, recycled raw materials actually cost more than their virgin counterparts and Guilford, in some cases, cannot pass this extra cost on to their customer. However, the strong desire to be a leader in the movement toward sustainable commerce and the belief that this vision provides a competitive advantage inspires the company to find environmentally responsible ways to offset these higher costs.

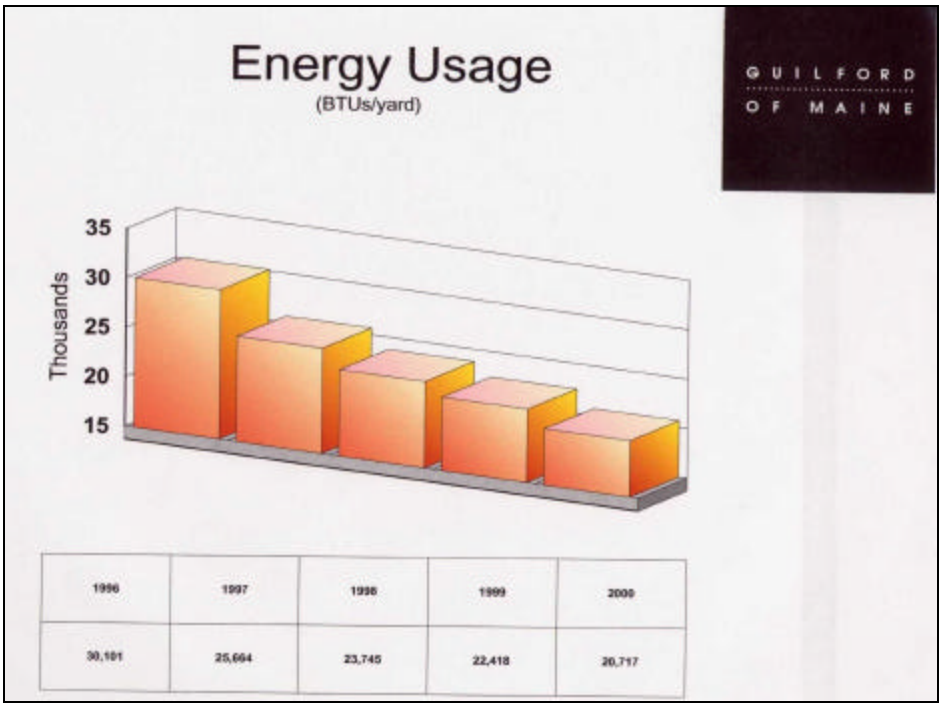
Smart Production at Guilford also focuses on details. The company uses a heated water spray to compact its PET fiber in a large vat. Paul Paydos explains that he walked past the vat for sixteen years and one day thought "how do we know we are using the right amount of water?" His query led Facilities Engineer, Dave Walker to purchase an $8.50 nozzle that fans and focuses the spray and requires less water to produce the same compacting effect. As a result, the company saves two million gallons of water heated to 140ºF annually. Another detail that saves money and is environmentally beneficial is the burning of waste woodchips from local lumber mills to generate 98% of Guilford of Maine's thermal BTUs.

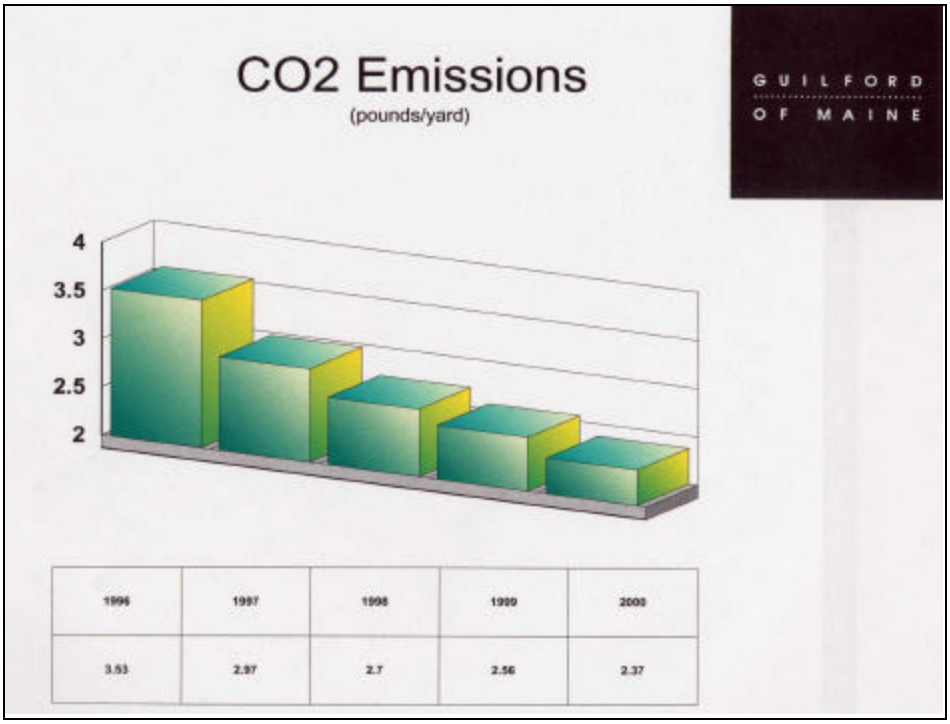
Fan nozzle responsible for saving 2 million gallons of heated water annually

Community outreach is something the company takes seriously. Guilford has formed a Community Advisory Committee, consisting of local citizens, elected officials, and representatives of environmental organizations and Maine State government. The company reports to the Advisory Committee to solicit feedback on its environmental impacts, future objectives, and environmental management system. Through the committee, Guilford of Maine hopes to improve both its performance as a company and the public's understanding and appreciation of what the company does.

Guilford demonstrates that the colossal goal of sustainability begins with small steps on the climb, even for a Fortune 500 company. Over the past five years, it has reduced energy and water consumption and cut its waste while realizing record profits in 1998 and 2000. (Charts showing these reductions are on the next page.) As more stringent environmental regulations are passed, and consumers and the government seek to buy safe, affordable, environmentally sustainable products, Guilford of Maine will be well-positioned relative to its competition. Guilford's true success is that it is not complacent and continues to endeavor for environmental excellence. This commitment is codified in the company's "Environmental Statement" which is given to each visitor upon entering the plant: "The company is committed to continual improvement of its environmental performance, and intends to achieve this by setting clear environmental objectives, and regularly monitoring progress against these objectives."

Wendy Porter, director of Environmental Management for Guilford, explains that the system of Eco-Metrics was challenging to establish and something that Porter hopes other companies will not have to go through alone. This is why, Guilford is willing to share the process used to develop its Eco-Metrics with other companies. Porter also notes that, as businesses build Smart Production practices in their organizations, it may present challenges to the traditional thinking of the regulatory community as well. Regulators, in her view, will need new models and increased flexibility for working with Smart Production companies to achieve environmental benefits.





Other charts produced by Guilford of Maine not included here show the following: Reductions in Water Use, Solid Waste, Amount of Virgin Materials Used, and Total Purchases of Non-Renewable Materials, and Increase in Percent of Recycled Raw Material.

International Paper, Jay:

Going beyond compliance and saving money.

International Paper's Androscoggin Mill has come a long way in protecting the environment in the past decade. The integrated pulp and paper mill produces 1,500 tons of mostly coated paper daily. In the late 1980s, the mill had many safety and environmental challenges. Since then, the mill has made major gains, first by coming into compliance, then by going beyond compliance through the initiation of two Environmental Protection Agency XL (Excellence in Leadership) projects.

International Paper's XL projects are pollution prevention projects. Smart production requires a holistic approach to redesigning production processes, but many substantial gains can be made by individual projects that both save a company money and protect the environment. Successful experience with pollution prevention projects can pave the way for businesses to embrace smart production.

The EPA's XL program enhances environmental protection while introducing regulatory flexibility and encourages innovative approaches to environmental protection (EPA, 1999). For one of its two XL projects, International Paper developed a predictive emissions monitoring (PEM) system. The system is a computer model designed to allow continuous predictions of particulate emissions from the waste fuel incinerator. Tom Saviello, manager for environmental, health and safety at the Androscoggin Mill, reports that the PEM system came close to predicting actual particulate emissions. Saviello explains the complexity of the problem: There are hundreds of variables, and something as seemingly trivial as the wetness of the bark could cause significant deviations in the model. The mill has already invested $100,000 in the project. Through more closely monitoring emissions, International Paper has learned how to operate its incinerator more efficiently. Whereas, in the past, the plant was operating near its license limit of 48 lbs/hour of particulate, test runs for the PEM project show the incinerator now putting out an average of only 28 lbs/hour. Optimizing boiler production while reducing emissions has led to savings that far exceed the cost of the PEM project. Being on the right track toward preventing pollution has led to unexpected monetary and environmental benefits.

Wood yard at International Paper

A less revolutionary concept, but one that also saves money and reduces air emissions, is the burning of waste oil instead of virgin oil. Number 6 virgin oil burned in the Androscoggin Mill's waste fuel incinerator contains 1.8% sulfur and that burned in the mill's recovery boilers contains 0.5% sulfur. By contrast, used oil contains, on average, 0.3% sulfur. Tom Saviello says that, though burning used oil is something that small businesses have long done to save money and protect the environment, used oil in the Northeast has never been burned on this scale as an industrial replacement fuel. In 2000, the Androscoggin Mill substituted used oil for Number 6 virgin oil in its boilers. This has resulted in a 30% cost savings for the company and a reduction of about 175 tons of SO_2 emissions.

	Oil Burned (barrels)			SO_2 Emissions (tons)
	1.8% SO_2	0.5% SO_2	0.3% SO_2	
1999	60,421	51,035	0	226
2000	0	0	101,767	51

International Paper's commitment to achieving higher levels of environmental performance has resulted in a business culture dedicated to innovation and continuous improvement. The payback has not only been better environmental performance but also substantial savings in the cost of operating the Androscoggin mill.

Goodkind Pen Company, Inc., Rockland:
Recycling as a way of doing business

Ian Lebauer, president, Goodkind Pen Company

Ian Lebauer is president of Goodkind Pen Company, Inc. His senior year at Bowdoin College he sat staring at the multitude of plastic pens on his desk and had an epiphany. "You tend to think of plastic as something durable and long-lasting," says Lebauer, "but pens are things that you think of as disposable." Lebauer went home shortly after and began working on a prototype for a different kind of pen, one that a customer would want to keep. He was attracted to wood because it is a sturdy, long-lasting, and environmentally friendly material. "Wood gains character over time," says Lebauer. Further, he realized that there was a niche in the market for a pen that was moderately priced and was not made of plastic. The result is Goodkind Pen Company and the Woody.

Lebauer used many concepts of Smart Production in the design of the Goodkind Pen. The body is made from white birch dowels. The dowels are the tail ends of pieces used for other products. They are considered trash and lumber companies usually burn the dowels for fuel. Goodkind Pen Company has arranged with a dowel manufacturer to have the dowel tail ends machined into pen bodies saving them on material costs and increasing the dowel manufacturer's product line.

The Woody has found a niche in the market.

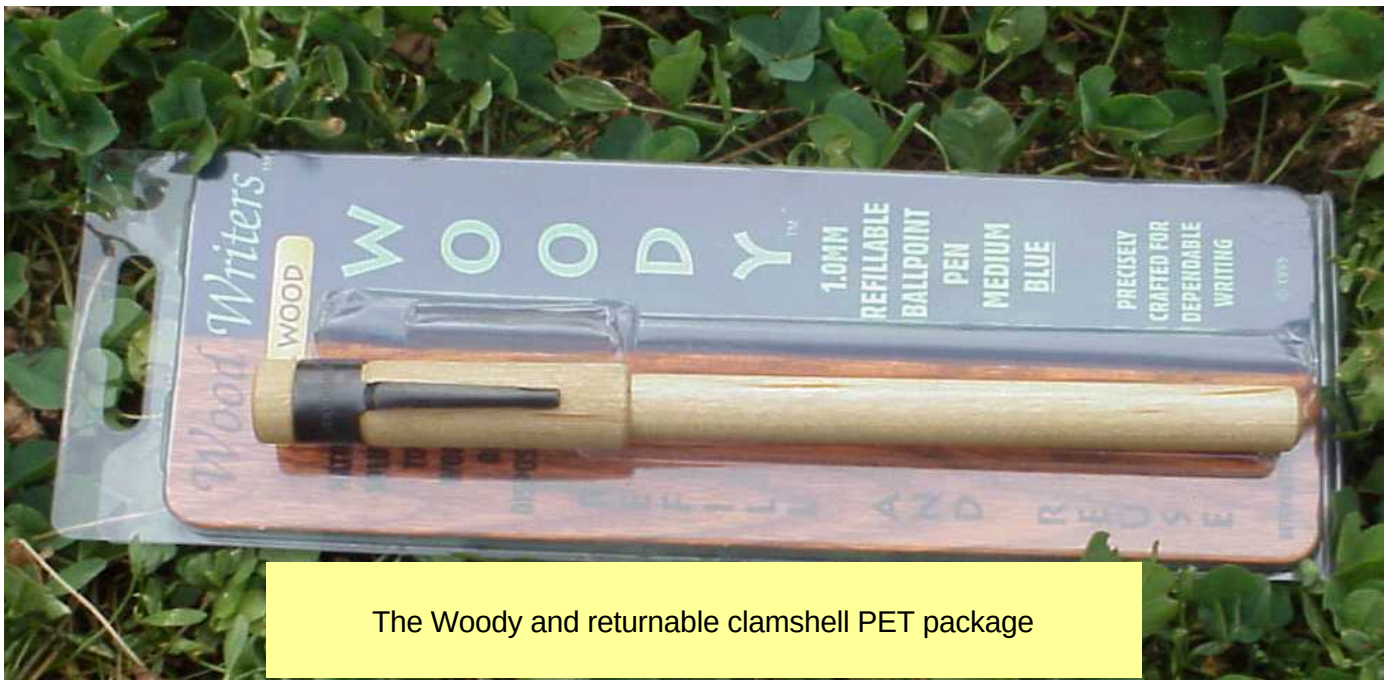
The cartridges in Goodkind pens are made of brass rather than plastic. According to Lebauer, brass cartridges last three times as long as those made of plastic. When the cartridge is empty, the consumer mails it back to the company to be replaced. In the future, Lebauer hopes to make the cartridges refillable. The returned brass cartridges are gathered up and recycled in bulk. Brass cartridges are less porous than conventional plastic ones which means that the ink evaporates less quickly. A breathable plug at the end of the cartridge also slows ink evaporation. Goodkind Pens are designed to be products that a customer will have for more than a decade. This theme is expressed in the marketing of the product which calls the pens "writing tools."

Smart Production ideas are also embodied in the packaging of the product. These writing tools come in a clear plastic clamshell package made from 100% recycled and recyclable PET (polyethelyne terephthalate). The customer simply removes the pen and extra ink cartridge and

mails the package back to the company. This saves Goodkind Pen the cost of having to produce more packages and reusable is always better from an environmental standpoint. There is a space on the package to indicate how many times the package has been used. Ian Lebauer reports that he currently has a 19% return rate. Many customers wait to return the package until they need an ink cartridge replacement and mail the original package back with their used ink cartridge inside. Goodkind sends them free replacement cartridges in return.

Concepts of Smart Production extend into almost every corner of Goodkind Pen's operations. The company does not use carbonized order forms because they are difficult to recycle and instead fills out two forms for each order and then recycles its half. All printing is done on recycled paper, and both sides are used before the paper is recycled. Lebauer even reuses UPS mailing envelopes by opening them up and resealing them inside out. The boxes in all incoming shipments are required to be a specific size so that pens can be shipped out in the same boxes. Newspaper is used for packaging rather than Styrofoam peanuts. Each customer is asked how he/she plans to display the product and the pens are only shipped pre-packaged upon request. If the customer intends to use the pens in a loose display, the pens are brown-bagged and mailed in bulk.

The Woody provides an example of how the design of a product as simple as a pen can be critical in realizing unforeseen economic and environmental benefits. Ian Lebauer believes that environmentally sound products should only cost more if they are also higher in quality. He asserts that when buying a Goodkind Pen, the customer gets a well-made product at a competitive price. The added benefit is that the pens are also environmentally friendly.



The Woody and returnable clamshell PET package

Alan Auto, Portland:
Seeking zero environmental impact

Alan Prosser cleaning up a small spill of oil with a rag.

Another small business that has made great strides toward sustainability is Alan Auto. Alan Prosser has been in the auto repair business since 1968, so he understands better than most the dangers of prolonged exposure to toxic chemicals. He lived for many years in a building where vehicle repairs were done.

He sometimes puts in sixty-hour weeks at his Volvo repair shop, located in Portland. His wife also works in the shop, and his son is a frequent visitor. Growing up along the Presumpscot River during the 1960s also gave Prosser a first hand look at the decimation that unchecked pollution has on an ecosystem. It's not surprising, then, that, in 1991, Alan Prosser made a commitment to achieve what he termed "zero environmental impact" from his Volvo service shop. He was concerned about having limited control over the quality of waste stream components such as water, solid waste, waste oil, and air emissions. With cooperation and assistance from his employees, Prosser analyzed waste stream sources and components and catalogued everything that needed to be changed. The list was so long, it was decided that it would be easier to construct a new facility. Alan Auto saves $2,000 annually due to increased operational efficiency, and reusing and recycling at his new facility.

Waste oil receptacle at Alan Auto

At the new facility, everything, including washing the cars, is done inside the shop so that no fluid is spilled outside and harmful emissions are contained. The facility has clean, well-lit, ventilated pits below grade. The pits allow employees to work underneath the cars instead of using lifts which take up room, and Prosser argues, are not as safe overall. The pits also allow the ceiling of the garage to be about six feet lower than the ceiling in a garage that relies on lifts. This smaller facility can be heated more efficiently. Energy-efficient fluorescent lights line the walls of the pit and radiant heating has been installed in the floors and walls, further reducing heating costs. There is also a heating unit installed in a dedicated space not frequented by employees that is fueled by waste oil generated by Alan Auto and solicited from the public and neighboring businesses. The oil heats water which is circulated underground to supply heat to several buildings in the complex. In the winter of 1999-2000, the heating unit was run on waste oil alone. Heating with used oil saves Alan Auto an average of $500 annually. Future plans for the facility involve hybridizing the system so that the radiant heating can also be fueled by used oil.

Alan Auto relies extensively on vacuuming and abrasive blasting to clean parts rather than on a solvent-based parts cleaner. The vacuum system produces a disposable package, keeps

the contaminated air from escaping into the atmosphere, and means that fewer parts need to be cleaned with the solvent, resulting in a significant reduction in Alan Auto's waste stream. The shop still has a petroleum-based solvent cleaner which is used for some jobs. The unit is kept locked and only after other cleaning options have been explored is permission given to use the solvent cleaner. Those parts that do need the parts cleaner are vacuumed first, reducing the amount of grit that enters the solvent bath. Prosser reports that Alan Auto has used the same solvent for the past five years.

Waste pan under car

One of Alan Auto's recyclamobiles

Prosser believes that prevention is much easier, safer, and more cost effective than reaction. There are pan and rag stations throughout the garage. Rags rather than quick dry (oil shale) are used to wipe up any spills as soon as they occur and are then sent off site for cleaning. Pans are placed under cars to catch any drops of liquid and are wiped clean after use. Keeping the pans clean ensures that fluids do not get mixed together. Jim Needham, who has worked with Alan for over twenty years, explains that clean pans allow good fluid that is drained from a car to be replaced after the car is worked on.

Alan Auto also has a comprehensive solid waste recycling program. Two Volvo station wagons, Alan calls "recyclamobiles", have been gutted, except for the driver's seat, and the floors have been sealed in order to prevent leakage of battery acid and oil. The cars store and transport cardboard, paper, plastic, tires, batteries, metal, and oil for recycling. The recyclamobiles and a more stringent solid waste management policy allow more than 95% of the waste stream to be recycled (0% was recycled in 1991).

To create a healthier and cleaner working environment, air cleaning equipment, carbon monoxide (CO) monitoring equipment, jumbo fans, and an air filtration/removal system were installed to track, control, and significantly reduce air pollutants.

Prosser said that if he could, he would retire and devote his time and energy to mentoring other repair shops on how they can best take steps toward sustainability. While government can play a role in the education process, Prosser insists that the key lies within the business community itself, "Businesses listen to their own, we have to be the mentors."

Auburn Machinery, Inc., Lewiston:
Reducing waste and adding value

Auburn Machinery began in 1976 as a company buying and selling used wood working machinery. In 1987, company president Thom Labrie realized that the rules of the game in the wood products industry were changing. The industry began to face competition from other materials, such as steel and plastics, and from foreign manufacturers of wood products. These factors caused the company to shift from used equipment to developing and marketing new and innovative machines that could help the primary woodworking industry add more value to its rough lumber as well as create more jobs.

Increasing foreign competition in a global economy coupled with concern for forest sustainability has encouraged the company to continue to create new technologies. These technologies will help the industry become more competitive by better utilizing its forest resources, improve its environmental performance and credibility with consumers, and make tangible contributions towards forest resource sustainability. The goal has become to develop cutting edge solutions to generate more high value solid wood products from the under-utilized and residue stream materials that traditionally ended up as low value chips, fuel, or mulch.

Illustration of potential recoverable product from residue waste stream material

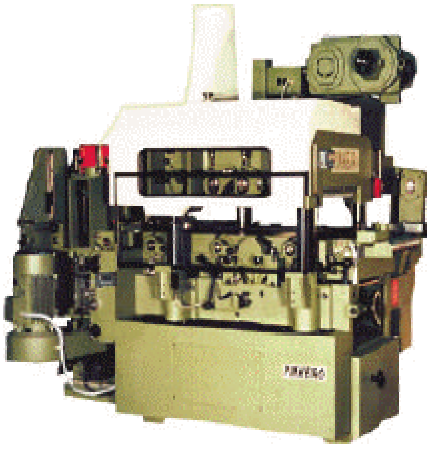
Auburn persevered through the research and development process until it had a working model of the first modern solid wood recovery machine in the country. The first generation of this machine converted slabs, edgings, waney stock, trim ends, and random sized and shaped material into square edged and uniform stock in only one pass. The first Yield Pro machine sold proved that more wood products and jobs could be generated by simply improving the utilization of the wood fiber that had already been harvested from the forest, and that fewer trees would have to be harvested to produce a given volume of solid wood products.

To Labrie's surprise, the greatest obstacle has turned out not to be inventing the technological solution, but rather selling the concept of recovery to the industry. Out of thousands of potential customers nation wide, Auburn Machinery has managed to generate only about twenty sales of recovery machines in the past four years. Between field studies, on site recovery demonstrations, and customer data, Auburn has proven that the payback on properly designed and executed wood recovery systems can be as short as three weeks. Auburn Machinery documents this claim in the company's "Recovery Demonstration Report", a series of four case studies from mills in Maine, New Hampshire, New York and Canada. In one of the studies, a dowel and turning operation in Maine, the demonstration proved that by converting only 33% of its residual material into proprietary stock for its manufacturing operations, the mill

could generate nearly $170,000 per year. None of the mills examined in the report decided to purchase a recovery machine, and at least one has since gone out of business.

Thom Labrie, president Auburn Machinery next to recovered wood

In 2000, to deliver solutions that enhance forest resource sustainability, Auburn Machinery established Auburn Educational Services Inc. to educate the industry on the concept of wood recovery. Auburn Educational Services has given seminars to Fortune 500 companies, government agencies, trade associations, universities and others (for more information, email info@auburneducation.com).



Wood recovery machine, Auburn Machinery

Another recent innovation has been to expand the capabilities of the Yield Pro to process wood with embedded nails from deconstruction and recycling operations so that it can be used to produce a wide range of higher value and environmentally friendly products. New recovery and recycling technologies are currently being developed at Auburn, and the company is also studying the feasibility of building its own wood recovery and value adding facility.

"Overall, learning how to process and sell recovered and recycled wood products will stimulate the industry to follow our lead and will inevitably help us to sell our machines," says Labrie. But he stresses that the consumer is the key to forcing saw mills to reduce waste wood. It is up to all of us, he insists, to be environmentally conscious in our consumer choices. According to Labrie, what his company does is not just Smart Production that promotes sustainable forestry, it is necessary production in an industry that faces ever-greater challenges in the future. Any mill that wants to compete nationally and internationally in the new millennium cannot afford to waste valuable solid wood material.

The Maine STEP-UP Program:

The businesses mentioned in this document are innovators who will be increasingly successful in the future. As Paul Hawken, and Amory and L. Hunter Lovins explain in their book, *Natural Capitalism: Creating the Next Industrial Revolution:*

> "The next Industrial Revolution, like the first one, will be a response to changing patterns of scarcity. It will create upheaval, but more importantly, it will create opportunities. Business must adjust to these new realities. Innovative companies are already doing just that. They're profiting and gaining decisive competitive advantage —and their leaders and employees are feeling better about what they do too. They're in the vanguard of a new business model: natural capitalism."

In the next Industrial Revolution, government and business need to have a new relationship with shared goals for a sustainable world. The Maine STEP-UP Program is designed to help create these new relationships.

PURPOSE: The **S**MART **T**RACKS *for* **E**XCEPTIONAL **P**ERFORMERS *and* **U**PWARD **P**ERFORMERS, or STEP-UP Program, offers recognition and other incentives to businesses interested in implementing sustainable practices. The program is designed to encourage companies to strive to achieve the sustainability goals set forth in the "Climbing the Mountain" diagram.

- STEP-UP is currently envisioned to provide a progression businesses can follow to become environmentally sustainable and to become leaders in the business community. The program is agreement-based, with both the DEP and the business committing to new ways of achieving corporate and environmental goals.
- STEP-UP is being proposed as three progressive tracks: the first will help businesses incorporate the basic tools needed to progress toward sustainable environmental practices; the second encourages businesses with the basic tools in place to further integrate Smart Production into their operations; and the third is for businesses who commit to achieve specific sustainability goals during the period of an agreement and who have already demonstrated commitment to Smart Production.

Maine STEP-UP Program Concepts:

- Establish a fundamental change in the relationship between DEP, the public, and participating businesses.
- Create a method to facilitate ever improving, and ultimately sustainable, environmental practices and performance.
- Establish entry requirements and benefits that progressively increase from track to track.
- From CEOs to line employees, gain facility-wide commitments to continual environmental performance improvements, and ultimately the integration of environmentally sustainable practices.
- Evaluate progress using an environmental performance measurement system (metrics)
- Include public reporting and community involvement as a basic program component.
- Educate other businesses and the public regarding environmentally sustainable practices.
- Use written agreements to define relationships and environmental sustainability commitments.

STEP-UP SMART TRACKS *for* EXCEPTIONAL PERFORMERS *and* UPWARD PERFORMERS

COMMITMENT TRACK

OBJECTIVE: Making exemplary environmental protection a fundamental aspect of day-to-day business operations.

ENTRY REQUIREMENTS:

1. **Environmental business commitment.** Enter into a two-year agreement and institute a business model that includes environmental protection as a basic element in day-to-day decision making , as evidenced by pursuing from the *Climbing the Mountain* diagram *Smart Production* pathways:

   a) E*nvironmental Management Pathway.* Implementation of a 3rd-party certified Environmental Management System (EMS), and

   b) *Worker & Community Pathway*. Integration of responsibility for environmental management into each employee's job description.

2. **Sustainability commitments.** Follow at least one additional sustainability pathway identified on the Climbing the Mountain diagram (total of 3 pathways).

3. **Performance measurement.** Define goals, establish a baseline, set benchmarks, and track performance for the selected pathways.

BENEFITS:

1. **Recognition.** Member facilities will receive public recognition from DEP.

2. **Relationship.** Participants define and negotiate the relationship needed with DEP.

3. **Mentoring.** Leadership and Sustainability Track businesses, and/or DEP will provide free assistance at a member's facility.

4. **Record keeping and reporting** . Alternative procedures can be negotiated.

LEADERSHIP TRACK

OBJECTIVE: Promoting sustainable environmental business practices with members of the public and other businesses.

ENTRY REQUIREMENTS:

1. **Environmental business commitment.** Same as Commitment Track but with a three-year agreement and a record of substantial compliance.

2. **Sustainability commitments.** Same as Commitment Track, but also incorporating the *Energy Pathway* and at least one additional *Smart Production* pathway into facility operations (total of five pathways).

3. **Performance measurement.** Same as Commitment Track.

4. **Public Involvement.** Seek public involvement in setting goals and report on progress toward goals.

5. **Mentoring.** Establish a relationship with businesses enrolled in the Commitment Track to teach them how to improve their environmental performance.

BENEFITS:

1. **Recognition.** Same as Commitment Track with the achievement of a *Smart Production* goal in the agreement resulting in a Governor's Award for Environmental Excellence.

2. **Relationship.** Same as Commitment Track but may be enhanced due to greater commitment.

3. **Mentoring.** Same as Commitment Track but may be enhanced due to greater commitment.

4. **Record Keeping and Reporting**. Alternative procedures can be negotiated.

SUSTAINABILITY TRACK

OBJECTIVE: Achieving sustainability and communicating progress to members of the public and other businesses.

ENTRY REQUIREMENTS:

1. **Environmental business commitment.** Same as Leadership Track but with a five-year agreement, and a record of substantial compliance.

2. **Sustainability commitments.** Same as Leadership Track, but achieving at least one Smart Production goal at the "top of the mountain" during the term of the agreement.

3. **Performance measurement.** Same as Leadership Track.

4. **Public Involvement.** Same as Leadership Track, includes establishing a community out reach program that solicits guidance about future actions.

5. **Mentoring.** Establish a relationship with businesses enrolled in Commitment or Leadership Track to teach them how to improve their environmental performance and incorporate sustainable practices in their operations.

BENEFITS:

1. **Recognition.** Members automatically receive a Governor's Award for Environmental Excellence.

2. **Relationship.** Same concept as Leadership Track; but may be enhanced due to greater commitment.

3. **Mentoring.** Same concept as Leadership Track but may be enhanced due to greater commitment.

4. **Record Keeping and Reporting**. Alternative procedures can be negotiated.

How does my Company Join?

PROCESS:

The Maine STEP-UP Program is a flexible means for a business to strive for environmentally sustainable levels of performance. The Department of Environmental Protection recognizes that business needs and environmental objectives will be different for each company. As such, the DEP will work with a business to negotiate an agreement that describes a unique relationship that will help the business to move toward environmentally sustainable practices.

To participate in STEP-UP, a business should contact the Maine Department of Environmental Protection (a list of contacts is found on page 28). DEP staff will then meet with the business to discuss its sustainability and business objectives and determine which track fits best as an entry point into the program. Once this is determined, an agreement will be negotiated to define specific commitments and benefits (see right hand column). Agreements will be for specified periods of time, during which performance in meeting goals will be measured. It is envisioned that at the end of an agreement, progress will be assessed, new goals established and new agreements formed to continue a business' participation in the program. Although a business may voluntarily leave the program at any time, if an agreement is terminated, the benefits of participating in the program also terminate.

Relationship between DEP and Company:

POTENTIAL SUSTAINABILITY COMMITMENTS MADE BY BUSINESS

(Commitments may be unique to each company)

Community involvement/public information
Elimination of toxics used and/or discharged
Elimination of hazardous waste generated
Environment as a core business value
Energy conservation/reduction/alternative energy sources
Mentoring other companies
Product-to-Service (see section — Climbing the Mountain: A Vision of Smart Production)
Recycling
Reduction in raw material use
Transportation
Worker involvement

POTENTIAL BENEFITS TO THE BUSINESS

(Benefits may be unique to each company)

Alternative record keeping requirements
Compliance assistance
Electronic reporting capability
EMS/ISO technical assistance
Energy auditing
Initial compliance inspection without penalties
Mentoring assistance
Performance auditing training
Designated DEP point of contact
Smart Production technical assistance
Recognition
Other benefits may be negotiated

Resources Available for the Climb:

Below is a list of DEP contacts, websites, articles, and books (asterisk indicates those mentioned in the document) to help your business produce smartly and begin the climb toward sustainability.

The Maine Department of Environmental Protection: Smart Production Initiative
www.state.me.us/dep/oc/smartprod/index.htm
To learn more about Smart Production and the STEP-UP program and find out how your company can join, contact:

DEP SMART PRODUCTION AND STEP-UP CONTACT:
Craig TenBroeck, director, Office of Policy Development & Implementation
17 State House Station
Augusta, ME 04333 e-mail: craig.w.tenbroeck@maine.gov
(207) 287-7828

STEP-UP AND POLLUTION PREVENTION CONTACT:
Ron Dyer, director, Office of Innovation and Assistance
(207) 287-4152 e-mail: ron.e.dyer@maine.gov

STEP-UP AND COMPLIANCE ASSISTANCE CONTACT:
Jim Dusch, Compliance Assistance
(207) 287-8662 e-mail: jim.e.dusch@maine.gov

WEBSITES:

- **Center for Clean Products and Clean Technologies a branch of the Energy Environment and Resources Center** http://eerc.ra.utk.edu/clean/
  The Center for Clean Products and Clean Technologies at the University of Tennessee, Knoxville, focuses on pollution prevention through design and manufacturing processes with the environment in mind.

- **Smart Communities Network**
  www.sustainable.doe.gov/business/buintro.shtml
  Produced and maintained by the US Department of Energy, the site includes links to assistance programs, success stories, and environmental management tools including: **Natural Logic Software** which provides software, databases and information tools for environmental and business excellence. Tools include an interactive checklist for environmental quality and efficiency, an ecoaudit toolkit, and environmental indicator software for business performance, and **Economic Input-Output Life Cycle Assessment**. This site furnished by the Green Design Initiative at Carnegie Mellon University allows users to estimate the overall environmental impacts from producing a certain dollar amount of any of 500 commodities or services in the United States.


- **Cool Companies** www.cool-companies.org/homepage.cfm
  Produced and maintained by the Center for Energy & Climate Solutions, a non-profit founded in 1999 to promote clean and efficient energy technologies as money-saving tools for reducing greenhouse gas emissions and other pollutants. The organization helps businesses, government, and environmental organizations develop technological, strategic, financial, and regulatory tools to foster the adoption of clean solutions. It seeks to cultivate and propagate real-world success stories that demonstrate the financial and environmental advantages of more effective energy management. The aim is to foster practical solutions directly, while also improving the broader debate over climate action and energy technologies.

- **Environmental Protection Agency Design for the Environment** www.epa.gov/opptintr/dfe
  The design for the Environment (DfE) program is one EPA's premier partnership programs, working with individual industry sectors to compare and improve the performance and human health and environmental risks and costs of existing and alternative products, processes and practices. DfE partnership projects promote integrating cleaner, cheaper, and smarter solutions into everyday business practices.

- **Environmental Protection Agency: Region 10 — Toward Sustainable Business**
  www.epa.gov/r10earth/sustainability/towardframe.htm
  Provides a definition of sustainability as well as a list of tools, resources, and links to the Center of Excellence for Sustainable Development, CERES, and others.

- **Global Environmental Management Initiative (GEMI)** www.gemi.org
  A non-profit organization of leading companies dedicated to fostering environmental, health and safety excellence worldwide through the sharing of tools and information in order for businesses to help other businesses achieve environmental excellence. Through the collaborative efforts of its members, GEMI promotes a worldwide business ethic for environmental health and safety management and sustainable development and leadership.

- **McDonough Braungart Design Chemistry** www.mbdc.com
  McDonough Braungart Design Chemistry is a product and process design firm dedicated to transforming the design of products, processes and services worldwide. They employ principles of what they call "eco-effective" design to create products and systems that contribute to economic, social and environmental prosperity. The website describes concepts such as "cradle-to-cradle" design instead of cradle-to-grave design, and how to design production systems that work with nature and not against it.

- **The Rocky Mountain Institute** www.rmi.org
  An entrepreneurial, nonprofit organization that shows businesses, communities, individuals and governments how to create more wealth and employment, protect and enhance natural and human capital, and increase profit and competitive advantage largely through teaching greater efficiency. RMI fosters the efficient and restorative use of resources to create a more secure, prosperous, and life-sustaining world with strong emphasis on market-based solutions.

- **University of Massachusetts, Lowell Center for Sustainable Production**
  www.uml.edu/centers/lcsp
  The Lowell Center promotes the transition to sustainable production by providing technical assistance and training to governments, community groups, environmental advocates and others searching for new ways to ensure human and ecological well-being within a healthy economy. The Center provides technical expertise on process redesign, pollution prevention, hazard reduction, product quality improvement, and increased production efficiency. It also works with management and employees to develop systematic programs for sustainability targeted to the needs of the organization.

- **World Business Council for Sustainable Development** www.wbcsd.ch
  A coalition of 125 international companies united by a shared commitment to the environment and to the principles of economic growth and sustainable development. The WBCSD was formed in January 1995 and in broad terms, the goal of the WBCSD is to develop closer co-operation between business, government and all other organizations concerned with the environment and sustainable development.

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Guilford of Maine
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